PATENT SPECIFICATION

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COMPLETE SPECIFICATION.

Improvements in Sheave for Wire Cables.

I, HERALD BENJAMIN GREENING, a Subject of the King of Great Britain, Manufacturer, and resident of 55, Queen Street North, in the City of Hamilton, County of Wentworth, Province of Ontario, in the Dominion of Canada, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The present invention concerns improvements in grooved sheaves for use in connection with wire cables of approximately circular cross-section, which sheaves are of the type (hereinafter referred to as the type specified) having a groove in which the cable is received in such manner that there is contact during operation between the bottom and the sides of the groove on the one hand and approximately half of the circumference of the cable.

It has been proposed to arrange segments of rubber at spaced points about the periphery of a V-grooved pulley and projecting through slots in the lower parts of the grooves for frictional engagement at spaced points with the belt passing thereover.

It has also been proposed to line the inner wall of a V-pulley with a thin stratum of soft or resilient material such as leather or rubber for special co-operation with a link-type of belt.

A further proposal has been to provide a pulley with a friction ring either representing the main area over which a flat belt traverses or being in the form of a flat surfaced ring of cross section forming the bottom of a V groove pulley for frictional contact with the under flat surface of a V belt drive.

These aforesaid proposals do not, however, relate to the type of sheave with which the present invention is concerned.

It has also been proposed in connection with a sheave of the type specified to provide a soft or elastic material at the bottom of the groove extending substantially the full width thereof so that the main load was carried directly thereby for the purpose of securing a more positive traction. Such a sheave would eliminate the destructive action on wire cables, but where heavy loads are carried such as in elevator work the cable would sink to an objectionable degree in the resilient element effecting a very undesirable distortion of the traction surface and causing heating and rapid deterioration of the resilient element and moreover requiring considerably more power to operate.

In this connection the side walls of the groove have been more-or-less V-shaped, but due to the major load being carried on the resilient bottom a highly destructive crushing action was present as the cable, sinking bodily in the resilient element, would become firmly wedged between the hard tapering surfaces of the groove.

The present invention effectively overcomes the above objections by providing a resilient bottom element which is of such width that it resiliently supports only a small central arc of the bottom section of the cable for the purpose of relieving the strain and wear on the several strands in this region which are subject to the greatest distortion as the cable passes about the sheave. At the same time the bottom section of the cable at either side of the central resilient element is directly supported on concentric metal surfaces which support a substantial portion of the load independent of the central resilient element and the side walls of the groove so that not only is the cable prevented from sinking bodily in the resilient element or from jambing or wedging destructively between the side walls of the groove but a desirable true running hard metallic surface will be at all times presented to the bottom section of the cable ensuring free running and long life both of the cable and the resilient cushioning element.

The maximum width of the centrally arranged resilient cushioning element according to the present invention can advantageously be such as to represent a support for the bottom of the cable of a width preferably not greater than that included in an arc of substantially 60° of the circumference of the cable or at

any rate only sufficient for the purpose set forth so that it does not represent the main under contact surface for the cable.

According to the invention there is provided for stranded cables, a sheave of the type specified having a groove resilient in part for contact with the cable, characterized in that the resilient element located centrally of the bottom of the groove is of such width that it resiliently supports only a small central transverse arc of the bottom section of the cable for the purpose of relieving the strain and wear on the several strands in this region which are subject to the greatest distortion as the cable passes about the sheave (for example, is of such width that it represents a support for the bottom of the cable of a width not greater than that included in an arc of 60° of the circumference of the cable), the bottom section of the cable at either side of the narrow central resilient element being directly supported on true running concentric metal surfaces which support a substantial portion of the load independent of the central resilient element and the side walls of the groove, whereby the objectionable sinking of the cable bodily in the resilient element and the destructive crushing of the cable between the side walls of a cable groove is obviated.

In one form of my invention a cable sheave is provided having a rim in which a resilient grooved ring of rubber is carried which presents friction and cushioning contact with the cable in combination with means presenting continuous metallic surfaces in the wall of the groove extending circumferentially in continuous running contact with the cable bottom and limiting pressure contact and wedging engagement of the cable with the grooved rubber ring.

In the accompanying drawings,

Fig. 1 is a cross sectional view of the rim of a cable sheave embodying the simplest form of my invention.

Fig. 2 is a cross sectional view of the rim of a cable sheave illustrating a modification of the invention.

Fig. 3 is a cross sectional view of a cable sheave illustrating a further modification.

It has been ascertained by careful observation in numerous experiments that the maximum wear of a wire cable occurs on the inward side of the cable engaging the sheave and that much of the wear and deterioration in the life is caused by the dilation of the small wires of which the cable is constituted in the sharp bending around the sheave. This dilation is caused by the tendency of the small loops of wire forming the spirals of the smaller composite wires forming the cable to spring or distort outwardly from the cable towards the bottom of the sheave groove as the cable bends round the sheave and in the normal operation of the cable on a steel sheave these small dilated loops are crushed out of shape. A continuous action of this kind naturally wears the cable rapidly.

In the simplest form of my invention as illustrated in Figure 1 the rim of the sheave 1 has formed in the transversely rounded bottom of the tapering cable groove 2 a narrow deep groove 3 and in this groove 3 is embedded an endless band of rubber. This rubber is of the quality ordinarily used in the tread stock of automobile tires. It is very resilient but tough and very effectively resists wear. The rubber is suitably bonded and preferably vulcanized in place and forms a cushion bearing for the wire strands at the central inward surface of the wire cable 4 as it is drawn tightly into the sheave groove 2.

It has been ascertained that the maximum dilation of the small wires of the cable occurs substantially in the inner centre line or in the axial plane of the cable corresponding with the radial centre of the sheave groove, consequently provision of this small rubber band in the narrow groove permits this dilation without injury and the cable operates at higher speeds and with less injury than when operated upon a solid metal sheave.

In the form illustrated in Figure 2 the sheave rim 5 is formed with quite a deep central groove 6 and two annular side grooves 7. These side grooves are preferably separated from the central groove by the annular narrow metal strips 8, the outward peripheral surfaces of which are shaped in cross-section to fit the contour of the cross-section of the cable 9 and presents continuous running contact with the bottom portion of the cable.

The inner surface of the groove 6 is preferably roughened and a circular strip of rubber 10 of a somewhat hard quality and capable of bonding with the steel surface is inserted therein.

A strip of rubber 11 is inserted over the rubber strip 10 and completes the bottom of the cable seat.

The rubber strip 11 is preferably formed of the quality of material used for automobile tire treads and is quite resilient and resistant to wear.

Rubber bands 12, which are of an I shape in cross section, are inserted into the grooves 7 which are also roughened or knurled and the quality of rubber of

these bands and substantially similar to that of the band 10.

Rubber rings 13 are nested into the rings 12 and are formed with the sloping inward sides 14 to form the sloping surfaces of the cable groove of the sheave.

These several composite rings are vulcanized into the sheave rim 5 and a bottom surface and side walls of tire tread rubber stock are provided, relieving the dilation or kinking of the small wires and also relieving the small wires along the sides of the cable from the detrimental crushing effect of the tapering walls in an ordinary steel rim.

In the form shown in Figure 3 the sheave rim 15 is formed with a deep rectangular groove 16 and embedded in this and engaging the bottom and side walls thereof is a band of rubber 17 of a hard quality similar to the rings 10 and 12 in Figure 2.

A ring of rubber 18, preferably of tire tread stock, is fitted into the rings 17 and embedded in this ring is a metal ring 19 preferably of U-shape in cross section, presenting two metal surfaces at the bottom of the sheave groove arranged either side of a central ring of rubber 20 and presenting continuous running contact with the underside of the cable.

The ring 19 presents metal surfaces similar to the surfaces 8 shown in Figure 2 but this ring is embedded in the rubber of the ring 18 and is cushioned thereby so that the entire strain of the pull of the cable is relieved, not only by the rubber of the ring 18 beneath the U-shaped ring 19, but by the rubber forming the tapering side walls of the sheave groove 21.

It will be seen that all the constructions of the invention herein shown and described have the arrangement in association with metal running surfaces of a band of rubber centrally at the bottom of the sheave groove provided for the purpose as hereindescribed of relieving the detrimental crushing of the small wires of the cable against metal surfaces as they are dilated locally towards the sheave in bending therearound.

It is important to note that in the forms of the invention illustrated herein the actual bottom of the groove on which the cable rests is represented by the combined metallic and cushioning contact surface. The cushioning surface is concentric with the curved bottom of the metal element and a continuous support of two distinct characteristics is presented to the underside of the cable in passing over the sheave.

It is preferable that the rubber material arranged within the centralized peripheral groove be capable of supporting the load applied thereto by the central contacting region of the cable to a degree substantially equal to the load supporting value of the continuous metal surfaces adjacent thereto so that the normal load will be taken up by the composite elements forming the groove bottom and the presence of the metallic running surfaces will act to support the cable in a firm manner against excessive embedment or wedging contact with the resilient element.

A smooth running rigid or semi-rigid foundation of a desired firmness is thus provided for the cable while avoiding wear on the dilated central inner wire strands and minimizing the destructive inward crushing encountered where the cable is allowed to jamb between two sharply sloping sheave walls.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. For stranded cables, a sheave of the type specified having a groove resilient in part for contact with the cable, characterized in that the resilient element located centrally of the bottom of the groove is of such width that it resiliently supports only a small central transverse arc of the bottom section of the cable for the purpose of relieving the strain and wear on the several strands in this region which are subject to the greatest distortion as the cable passes about the sheave (for example, is of such width that it represents a support for the bottom of the cable of a width not greater than that included in an arc of 60° of the circumference of the cable), the bottom section of the cable at either side of the narrow central resilient element being directly supported on true running concentric metal surfaces which support a substantial portion of the load independent of the central resilient element and the side walls of the groove, whereby the objectionable sinking of the cable bodily in the resilient element and the destructive crushing of the cable between the side walls of a cable groove is obviated.

2. A sheave according to Claim 1 in which the resilient material is arranged as a narrow middle band of rubber of a tough character in an otherwise metal sheave and in which the rubber material is of such character as to be capable of supporting the load applied thereto by the wire cable to a degree substantially equal to the load supporting value of the metal surfaces at the sides of the cable groove, and such material permits the local distortion of wires projected

inwardly toward the sheave from the cable surface thereby avoiding the fracture of same.

3. A sheave according to Claim 1 in which the metal surfaces are each in the form of a ring and have between them a ring of rubber material and have on the other side of each of them a ring of rubber material to form the side walls of the groove.

4. A sheave as claimed in claim 3 in which the continuous metal surfaces form parts of a metal annular member floatingly supported within a resilient body of rubber material mounted in the rim of the sheave.

5. A sheave as claimed in Claim 4 in which the metal member is of channel-shaped cross section and is embedded in the rubber ring arranged in the sheave rim with its channel walls disposed outwardly and terminating substantially flush with the walls of the sheave groove and forming a circumferential running contact for the rope, the channel in said ring being filled with a rubber material presenting a cushioning contact to the cable between the metallic surfaces of the ring.

6. A sheave as claimed in any of claims 1 to 3 in which the rubber cushioning means is incorporated in the rim of the sheave by vulcanizing in association with an outer stratum of a harder rubber stock which bonds more readily to the rim surfaces.

7. A sheave for wire cables according to claim 1 constructed arranged and adapted to function substantially as described with reference to Fig. 1 or Fig. 2 or Fig. 3 of the accompanying drawings.

Dated this 1st day of January, 1934.

For the Applicant,
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Fig. 1.

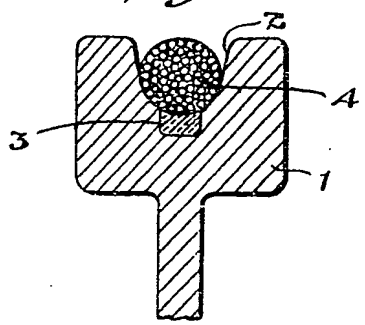


Fig. 2.

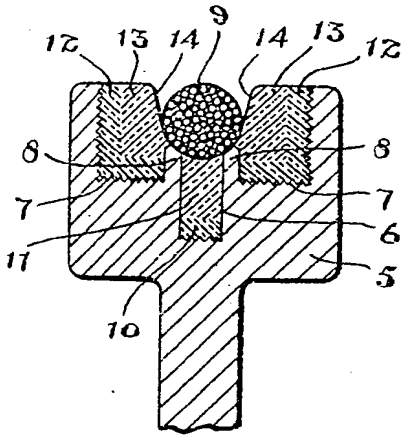
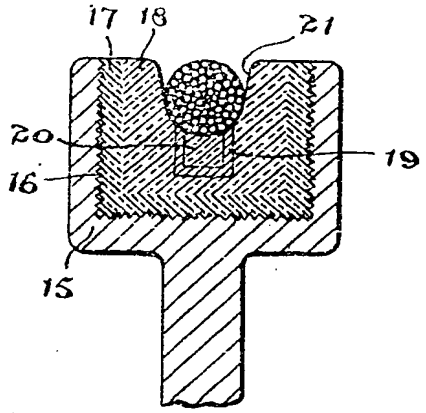


Fig. 3.



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